Light and Lighting

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Rule or Reason?

WHEN illuminating engineering was in its infancy forty years ago matters were chaotic. We had indifferent implements, little experience, few principles and no rules.

Now, "forty years after," is there not a danger of excessive regulation? The I.E.S. Code has proved its value, not least because it is general and leaves opportunity for sagacity and craftsmanship in its interpretation.

In certain fields, streets, schools, factories, offices and mines, guidance is also valuable, provided the framing of rules does not exclude reason and leaves opportunities for initiative in applying them.

But let us not assume too readily that codes or even specifications are wanted in every phase of lighting. Illumination is an art quite as much as a science, demanding that rules shall sometimes give place to reason and technical data subordinated to craftsmanship and consideration of *effect*.

School Lighting Demonstration at Sheffield

The I.E.S. Sheffield Centre staged a very enterprising and successful meeting on October 13, when Mr. P. H. Harris lectured on school lighting, illustrating his remarks by the aid of two model classrooms at Woodthorpe Secondary School, specially equipped respectively with tungsten and fluorescent lighting.

One of the lecturer's main points was the vital part played by decoration and atmosphere as an aid to lighting. This conception had guided the choice of decoration for the two rooms, treated respectively in brown and cream and green and cream. In addition, desks were finished in light oak, and blackboards assumed a corn-coloured hue, on which blue chalk is used.

Mr. G. R. Taylor, Chairman of the Centre, presided over the meeting. The audience, upwards of 200, included Alderman J. H. Bingham, Chairman of Sheffield Education Committee, Mr. S. Moffett, Director of Education, and a number of local teachers, architects, and engineers.

Next I.E.S. Meeting in London

On **December 9** DR. J. H. NELSON will be reading a paper on **Decoration and Industrial Lighting** at a meeting of the I.E.S., to be held at the Lighting Service Bureau, Savoy Hill, London.

This subject is one which has aroused considerable interest during recent years.

It is understood that Dr. Nelson will deal with ideal seeing conditions in theory and in industrial practice and the interdependence of lighting and decoration. The requirements of industry and personal tastes and the important question of costs will also be discussed.

American I.E.S. Convention

A feature of the Convention—now described as the National Technical Conference — organised by the American I.E.S. in New Orleans last September, was the attendance of delegates from abroad, amongst whom were included more than 25 lighting specialists from England, Canada, Cuba, and South America. The message of greeting from this country, conveyed by Mr. J. M. Waldram, was, as we have already noted, received with enthusiasm. Another item of interest was the demonstration by Mr. E. D. Tillson, at a luncheon meeting attended by over 400 delegates, of new devices calculated to "make life easier, more comfortable, and safer." Included were a new three-billion-candle-power, fog-penetrating flashlight for aerodromes, new plastics louvre fittings, and an Army "snooperscope," based on infra-red radiation. Dr. M. Luckiesh, well known throughout the world as the director of the Lighting Research Laboratory at Cleveland, Ohio, was awarded the I.E.S. Gold Medal for lighting research.

The Gas-Arc

A New Source of Light

Members of the I.E.S. Liverpool Centre were privileged on October 21 to witness a demonstration by Dr. J. N. Aldington of what is essentially a new source of light, the "gas-arc," which is noteworthy for the fact that a very intense light is developed in one of the rare inert gases, Xenon. It is of a very compact nature, 10 kw. being dissipated in a tube approximately 2 cm. thick and 20 cm. long. Dr. Aldington foresaw no difficulty in producing lamps of still higher power if desired. In order to withstand the high current density special electrodes and an all-quartz envelope are used. The lamp is essentially a low voltage, high current device and can operate on either A.C. or D.C. Light is produced by complex atomic and temperature processes which give a dominant continuous spectrum superimposed on that characteristic of the rare gas. As a result an intense white light, aproaching very nearly to daylight, is obtained.

The history of the development of the lamp is interesting. It was apparently first developed as a flashlight of short duration for the purpose of enabling night photographs of enemy territory to be obtained, and it was actually used in this manner on D-Day. Subsequently, the possibility of evolving a continuous light of exceptionally high intensity adaptable to other purposes was envisaged by Dr. Aldington, and the present lamp is the result. It is probable that one of its first fields of usefulness may be for lighting television and film studios, but other applications will doubtless be found. It is early, as yet, to estimate precisely the light output from this new source in its various possible forms, but it was stated that a 5 kw. source is roughly equivalent to a hundred 100-watt lamps of the ordinary filament type.

The lamp is to be exhibited to the I.E.S. Manchester Centre on November 6. It will be recalled that Dr. Aldington, in his recent papers before the Society in London, hinted at these developments. No doubt London members, too, will have an opportunity of seeing the lamp in operation in due course.

I.E.S. Visit to Wembley

On Tuesday, October 28, some 60 I.E.S. members (including a number from Centres and Groups) took part in a visit to the Research Laboratories of the General Electric Co., Ltd., at Wembley.

During the course of the afternoon the party made an extensive tour of the laboratories and were able to see many items of interest.

In the photometry section visitors were shown the new 12-ft. integrating sphere which, when completed, will be the largest in the country, and in the short time available were able to form some idea of the intricate work connected with colorimetry.

Great interest was shown in the new double negative carbon arc lamp which has been produced for the lighting of cinema studios and which result in a considerable saving in current. One difficulty in lamps for studio use is the production of noises and a very effective demonstration showed how ripples in the electrical supply may be reproduced as sound in the ordinary arc. This new lamp, however, makes much less noise than arc lamps normally in use. The party were also shown a special type of carbon arc which had been developed during the war for use in aircraft.

The development and uses of the new mercury-cadmium compact source lamp were explained and demonstrated and the high quality of colour reproduction with this lamp was seen. Visitors were also able to see some outsize experimental lamps of this nature ranging up to 25 kw.

In the illumination laboratory there were many items of interest including the method of plotting polar curves and iso-candle diagrams, the procedure with which has been greatly simplified. In the system which was demonstrated the operator, having set up his equipment,

sits at a desk in front of his chart on which is projected a small spot of light which varies its position from the centre of the polar chart in direct proportion to the candle power of the lamp or fitting being tested. By turning a wheel at the desk the operator turns the mirror system of the apparatus through any required angle, the polar diagram turning through the same angle automatically. By marking the position of the light spot at any particular time the polar curve can be drawn out. Other items in this laboratory included the calibration of portable photometers and thermal tests on lighting units.

During an interval for tea, Dr. Walsh, President of the I.E.S., thanked the General Electric Company for their hospitality and for the excellent manner in which the visit had been organised. Mr. Waldram in reply said that his company were very pleased to welcome the I.E.S. and regretted that Sir Clifford Paterson, the Director of the Research Laboratories, was unfortunately unable to be present to welcome them himself.

Norwegian Lighting Development Association

Readers will be interested to hear that there is a very active body in Norway concerned with education in illuminating engineering. The Norwegian Lighting Association, which has recently issued its annual report, was formed in 1936. It has now 72 members, of which 19 are electricity works, 6 are societies and institutions, and 30 are firms. The remainder are "personal members," amongst whom we notice one foreign representative, Mr. George Ainsworth, of New York. The Association has been responsible for many courses of lectures as well as written contributions on illumination—special attention being devoted to fluorescent lighting. It receives from the Ministry of Reconstruction plans for houses in war-ravaged regions and is responsible for planning the lighting therein. It is also in touch with the Society for the Maintenance of Ancient Buildings with a view to suggesting suitable lighting methods. An official who seems to have no counterpart in this country, the "State Antiquarian," is co-operating in this work. The Association has gathered together the nucleus of a library dealing with lighting literature, and is now discussing the establishment of a technical laboratory for illumination.

Lighting Standards in Finland

Another instance of progress in Scandinavia is afforded by Finland, where a committee has recently been formed to create national standards and rules for lighting. In this connection a request for information has been addressed to the I.E.S. in this country, and copies of the I.E.S. Code and other relevant literature have been furnished. It is evident that the movement towards codification in connection with illumination is not confined to this country—quite a useful development if it is not pushed too far.

British Kinematograph Society

Provisional Lecture Programme

The provisional lecture programme for 1947-48 of the British Kinematograph Society certainly offers ample fare. During the period October to April over 40 meetings of various kinds have been arranged. (In addition to the meetings arranged in London there are sections in Manchester and Newcastle on Tyne.) Many of the papers deal with topics of direct interest to illuminating engineers. Dr. Wright is responsible for several, including one on "Colour Vision and the Film Industry." Other items include "Light Efficiency of Projectors" (W. Buckstone), "Light and Colour in Stage Presentation" (P. Corry), and "Light Production from the Carbon Arc" (H. P. Woods). Readers interested may obtain particulars from the secretary of the Society at Dean House, 2, Dean-street, London, W.1.

Forthcoming I.E.S. Meetings

(Provisional List)

MEETINGS IN LONDON

1947.

Dec. 9th. Sessional Meeting. DR. J. H. NELSON on **Decoration and Industrial Lighting.** (*At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.*) **6 p.m.**

MEETINGS OF CENTRES AND GROUPS

1947.

Dec. 1st. MR. H. R. RUFF and MR. I. G. FOWLER on **Black Light.** (*At the Leeds Corporation Electricity Dept., Whitehall Road, Leeds.*) **6 p.m.**

Dec. 1st. MR. T. O. FREETH on **Lighting in the Home.** (Joint Meeting with the Sheffield Electrical Association for Women.) (*At the Medical Library, The University, Western Bank, Sheffield.*) **6 p.m.**

Dec. 2nd. MR. H. R. RUFF and MR. I. L. FOWLER on **Black Light.** (*At the Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

Dec. 3rd. MR. A. G. PENNY on **Some Impressions of Lighting in the U.S.A.** (*At the Minor Durant Hall, Oxford Street, Newcastle-upon-Tyne.*) **6.15 p.m.**

Dec. 4th. MR. L. G. APPLEBEE on **Stage and Colour Lighting** (Joint Meeting with the Electrical Association for Women.) (*At Cardiff Corporation Demonstration Theatre.*) **6.30 p.m.**

Dec. 4th. Address by the President (DR. J. W. T. WALSH.) (*Gloucester and Cheltenham Centre.*)

Dec. 4th. MR. W. IMRIE-SMITH on **Industrial Lighting.** (*At the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6 p.m.**

Dec. 4th. MR. F. JAMIESON on **Shop and Store Lighting.** (*At Exeter.*)

Dec. 5th. MR. F. JAMIESON on **Shop and Store Lighting.** (*At the Electricity Showrooms, Bath.*) **7 p.m.**

Dec. 5th. MR. ARTHUR L. HALL and MR. STUART D. LAY, Discussion on **Lighting and Industrial Decoration.** (Joint Meeting with Institution of Production Engineers.) (*At the Imperial Hotel, Temple Street, Birmingham.*) **6 p.m.**

1947.

Dec. 5th. DEBATE: **That the use of Fluorescent Lighting is not in the interest of the public.** (*At the City of Nottingham Gas Dept. Demonstration Theatre, Parliament Street, Nottingham.*) **5.30 p.m.**

Dec. 9th. MR. C. R. BICKNELL on **Fluorescent Lamps and Lighting.** (*At the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.*) **6 p.m.**

Dec. 11th. MR. C. DYKES-BROWN on **Cold Cathode Fluorescent Lighting Installations.** (*At the Electricity Department Demonstration Theatre, Charles Street, Leicester.*) **6.30 p.m.**

Dec. 16th. MR. J. B. BICKERDYKE on **Natural Lighting in Factories.** (*At Stoke-on-Trent.*)

Dec. 18th. MR. F. WIDNALL on **The Development of Fluorescent Lighting in Mines.** (*At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C. 3.*) **6 p.m.**

Dec. 19th. MR. F. WIDNALL on **Mines Lighting.** (Joint Meeting with the Association of Mining, Electrical and Mechanical Engineers, Lothian Branch.) (*At the Heriot Watt College, Chambers Street, Edinburgh.*) **6.30 p.m.**

1948.

Jan. 1st. MR. T. O. FREETH on **Lighting for Effect.** (*At Exeter.*)

Jan. 1st. MR. F. C. SMITH on **Gas Lighting.** (*At Cheltenham.*)

Jan. 2nd. MR. T. O. FREETH on **Lighting for Effect.** (*At Radiant House, Bristol.*) **7 p.m.**

Jan. 5th. Joint North Midland Area Meeting at Leeds. (*At the Leeds Corporation Electricity Dept., Whitehall Road, Leeds.*) **6 p.m.**

Jan. 7th. Address by the President (DR. J. W. T. WALSH). (*At the Cardiff Corporation Demonstration Theatre.*) **6.30 p.m.**

Jan. 7th. MR. E. J. STEWART on **The Lighting of Housing Estates.** (Joint Meeting with the Association of Public Lighting Engineers.) (*At the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6 p.m.**

Jan. 7th. Annual Dinner of the Newcastle Centre. (*At the Minor Durant Hall, Oxford Street, Newcastle-upon-Tyne.*) **6.15 p.m.**

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programme, mentioning subject, author, place, date and time of meeting; summaries of proceedings at meetings (which should not exceed about 250–500 words) and any other local news are also welcome.)

Design of Industrial Lighting Equipment

Summary of a paper read by Mr. F. Widnall at the Meeting of the Illuminating Engineering Society held in London on November 11th, 1947

The detailed design of industrial lighting equipment requires the co-ordination of a number of factors and involves a good deal of compromise between what is theoretically desirable and what is practically obtainable. The degree of accuracy of optical requirements is one of the important decisions that has to be made. Optical accuracy and close control of light output are always possible at a price, but the cost of optically worked reflectors is likely to be more than ten times that of pressed reflectors. The degree of accuracy required should, therefore, be given careful consideration.

Choice of Material

In recent months the difficulty in obtaining cast iron has resulted in the increased use of aluminium and its alloys for lighting fittings. They are, of course, much lighter and do not rust, the difficulty being in the additional precautions which must be taken when they are used in conjunction with dissimilar metals. The electro-chemical action at the junction of aluminium and most other metals causes corrosion, particularly in the presence of moisture. In the case of reflection those made of anodised aluminium are generally cheaper and easier to manufacture than other types of reflector.

Transparent and translucent plastic materials are in their infancy at the moment but are being applied and may have a great future. They are relatively easily worked and may generally be more safely stressed than glass, though not perhaps quite so much as many people imagine. The main difficulty with transparent plastics is surface scratching and temperature limitations which usually prevent their use above about 75-70 deg C. These plastics may possibly find a use in the design of flame-proof equipment in certain applications where toughened glass is not easy to obtain.

Ventilation and Noise

In fittings using lamps over 250 watts heating is a major problem. Lamp caps, holders, and glass, all have well-defined temperature limits which must not be exceeded and hence to house a high-power lamp in a unit of reasonabe size is a difficult problem where forced ventilation has to be avoided. Where natural draught only is available wide openings are necessary and if fins are used to keep temperatures down it is of no advantage to space them closer than one inch. Also chokes used in series with fluorescent lamps inevitably have a loss of a few watts which appears as heat in the choke. Usually the choke and the capacitor have to be included in some enclosure, but they must not be completely insulated and suitable arrangements must be made for dissipation of the heat.

The choke is also the usual source of noise, though modern well-designed and manufactured chokes do not give trouble except perhaps in extremely quiet situations. It is impossible, however, to completely eliminate noise from a choke and care must therefore be taken that a fitting does not unduly amplify this noise. Resilient mounting of the choke in one form or another reduces the noise but the design of such mounts is not simple and requires a good deal of experience and adequate testing.

Testing

Optical testing, production of polar curves, etc., is well known, and electrical testing is generally of a standardised nature though high voltage tests, insulation tests, and electrical performance tests are very important. The tests of major interest cover temperatures, vibration, noise, life, and such matters as corrosion or failure of finishes.

Vibration tests are necessary on a wide range of industrial lighting equipment which may be mounted on crane gantries, trolley-bus poles, or similar positions where they are subject to all kinds of indeterminate shocks and vibrations. The normal method of test is to use a machine which vibrates an arm over a cycle of frequencies and amplitudes, the equipment under test being rigidly fixed to the vibrating arm. Shock tests are common on equipment designed for naval use and such tests quickly indicate the need for locking screws and ensuring tight clamping of frames and fixings.

Noise tests are a specialised study, as the technique of measurement and correct interpretation of results is difficult. Life tests form the background of a designer's experience and there is always something new to be found from them.

Mine Lighting In The Ruhr

In his paper on Lighting in Coal Mines given to the I.E.S. earlier this year, Mr. J. Ivon Graham referred to the high standard of illumination in the Ruhr coal mines.*

An account is now available of the advantages of permanent coal face and roadway lighting as experienced in the Ruhr.†

In its opening section the report emphasises the low reflection factors met with underground, from the surface of the coal itself, rubble, timbering, etc., and the fact that in underground working "rod vision" is of primary importance. A surface brightness such that the eye will not be unnecessarily and continuously overstrained is essential. This involves a minimum average illumination of 2 lumens per square foot. A really substantial improvement in general lighting can scarcely be obtained by means of portable lamps and the report therefore enters upon a discussion of the possibilities of permanent lighting.

Mains lighting, which is regarded as the most suitable form of permanent lighting, has been introduced on a large scale into the mines of the Ruhr. Next in demand from a lighting technique point of view is the compressed air lamp which can be used in places where a supply of electricity is not yet available. (A description of this lamp, with which either tungsten or mercury lamps may be used, was given by Mr. Graham in the paper quoted above.)

Permanent Face Lighting

In the great majority of cases 220-volt supply is used for both road and face lighting, and this is recommended for all new plants. At the face the lighting network consists of individual sections averaging 25 metres in length. Each section has 4 to 5 lamps of about 40-watts, and the lamps are about 5 to 6 metres apart. Where, as in some cases, 60-watt lamps are used, the lamps are spaced 10 metres apart. The best type of lamp and the most advisable spacing depend upon a variety of factors (seam depth, waste content, incline, type of coal, etc.) and cannot be stated with exactitude at the present time. Detailed tests, taking into consideration construction, technical considerations and, particularly, environment are now being made, and it is hoped as a result to evolve the most suitable lamp, and to standardise its production.

Experience has determined the most expedient lighting arrangements at the face, and these are embodied in the following formulae:—

Lamp distance A = seam thickness M x 2 in metres, ... (1).

and

Lamp capacity L = A x 10 in watts per lamp, ... (2).

According to this formula, in a seam 1.5 metres thick, 30-watt lamps should be spaced 3 metres apart, and 60-watt lamps 6 metres apart. These distances are generally observed in practice.

Mains lighting is easier to install and maintain if the fittings are connected in the line of cable, as is the case in 84 per cent. of the mines under review in the report. Only in a very few cases are fittings attached to branch cables. In general, the reason for the retention of this practice is to facilitate the changing of position of individual lamps.

Opal well glasses have proved eminently suitable as protector glasses though there are still many types of glass in use. Opal well glasses are predominantly employed to the extent of 52 per cent., the proportion of matt interior glasses in use being 22 per cent., and that of daylight glass, 26 per cent.

Individual sections about 25 metres long are coupled together by plugs and sockets which can also be used for signalling purposes. These plugs and sockets either have a built-in interlocking switch, or are designed as switch plugs and sockets with a signalling button. At present, special signal switches are mainly used, but in other cases signalling is performed by a draw-rope laid throughout the face. In future, however, signalling by means of plugs and sockets will probably become universal because this method is cheaper to install, operate and maintain than the signalling switch method. The draw-rope arrangement has, however, the advantage that signals can be given from any part of the face simply by pulling the rope.

Although the methods referred to above have been used so far mainly in mines with predominantly shallow formations, the report states that there is no reason why they should not be used in other cases. Above all, bearing in mind the enormously increased working

*Trans. Illum. Eng. Soc. (London). Vol. XII. No. 6—1947.

†Appendix No. 9, Vol. III to the B.I.O.S. Final Report No. 394 (H.M. Stationery Office, price 9d.).

difficulties, there is certainly no reason why permanent lighting should not be used. Rubber hose conductors are easier to handle than compressed air pipes, and the protection of lamps from damage through subsidence can be arranged in exactly the same way as with hand lamps, i.e., by carefully hanging the lamps behind the props, etc.

Roadway Lighting

All the remarks about face lighting apply generally to roadway lighting, especially to lighting plant in gate roads. Rubber lead cables with an average cross section of 3 x 6 mm² are mainly used for transmission. In several cases 75-watt lamps spaced 25 metres apart, are in use, though occasionally 40-watt lamps are used at intervals of 5 metres, or 200-watt lamps at intervals of 50 metres.

Pit bottoms, as well as loading bays, crossings, important switches, and stopping points in main and gate roads, are generally well illuminated, mostly with 150-watt lamps at intervals of 20 metres. Added to these are the purely pit bottom lamps, the power of which may be as high as 1,000 watts.

In trolley-wire roads, the lighting current is not taken direct from the trolley wire, but from a special light transformer, so that if the trolley wire is cut out the road lighting remains in operation.

It is a regrettable fact, the report continues, that, simply because the eye is adaptable, road lighting underground is still, in many cases, far from sufficient. When it is remembered that the eye reacts in as many seconds to "brightness" as it does in minutes to "darkness," that it takes almost an hour to bridge fully the gap between daylight and the darkness of the pit bottom and, finally, that every strong light met with on the way down interrupts and lengthens the process of adaptation, there is a very strong case for improving the existing roadway lighting. To meet future requirements, efforts must be made to improve the constructional arrangements, firstly, by attaining real overall general lighting, and secondly, by a progressive but gradual reduction in the intensity of the lighting from the pit bottom to the coal face. As a result the strain imposed upon the eye by adaptation will be correspondingly diminished and the maximum power of perception assured and, in this case, the stronger lighting met with at crossings, bends, etc., would have only a temporary effect.

Films on Vision and Illumination

Films on lighting and related subjects are occasionally shown at meetings of I.E.S. Centres and Groups. A list of such films has now been compiled by the I.E.S., the list including both 16 and 35 mm. films available, either from firms in the lighting industry or through normal cinema trade channels.

During the morning and afternoon preceding the opening Sessional meeting on October 14 a number of such films as are available through the cinema trade was shown to representatives of Centres and Groups so as to facilitate a selection of those likely to prove interesting to I.E.S. meetings.

This was an enterprising step which is likely to lead to useful developments in course of time. For the moment, however, it was felt that though some of the films were well produced and of general interest they had little direct bearing on illumination; whilst others, which purported to deal with lighting and/or vision, were considered to be too old and out of date to be of much value.

There are also, certain films dealing with particular aspects of lighting which have been prepared by various firms in the lighting industry and which were not available for display on this occasion. It would appear, however, that there is a need for a good film or a series of films dealing with modern methods of illumination. The preparation of such a film or films would, no doubt, prove to be an expensive matter but one which might well be tackled with the co-operation of those directly interested in the production and ultimate use of the film, or with its general educational value.

American I.E.S. Lighting Handbook

From a note appearing in *Illuminating Engineering* it is evident that the Lighting Handbook, now published by the American I.E.S. and offered to its members, is a very substantial production. It is stated to contain more than 500 illustrations and more than 850 pages of information on lighting. A feature is the inclusion of advertising matter and no fewer than 200 pages are allotted to catalogue data on lighting equipment and materials.

"Footometer" and "Height Finder"

Aids to Street Lighting Design

Illuminating engineers are constantly preoccupied with problems associated with the measurement of light from street lamps, and with the rather tedious calculations often associated therewith. Mr. W. J. G. Davey, for example, has devised various useful short-cuts in this connection.

But in addition to these specialised problems there are others of a simpler nature, for instance, the determinations of heights of lamps and distances between them. In the course of his recently delivered address as Chairman of the I.E.S. Birmingham Centre, Mr. C. J. Allderidge described two instruments which he had devised for these purposes, which may be termed respectively the "footometer" and the "height finder"—the former an apparatus which is attached to a motor-car and automatically measures off the road in feet as it travels.

In describing the footometer Mr. Allderidge explained that the instrument can be attached to the dashboard of a car and driven by the speedometer cable. A difficulty, however, arises from the unsuitability of the direct gear ratio, as is used on the normal mileage meter. Variations of tyre pressure and tyre wear may materially affect the accuracy of measurements. One must, therefore, use some vernier adjustable ratio which is continuously progressive, and Mr. Allderidge found a solution in a tapered wheel driving into two spring-loaded plates. With this device it was possible to obtain an accuracy to a foot or 18 inches in 1,500 feet—quite good enough for positioning lamp columns.

The first meter suffered from the drawback of having only a single dial graduated for 100 feet, so that it was necessary to count the number of revolutions of the dial and the total count could not always be relied upon, especially when the driver was negotiating traffic. In the final design, therefore, the meter was furnished with a second dial to count the hundreds of feet.

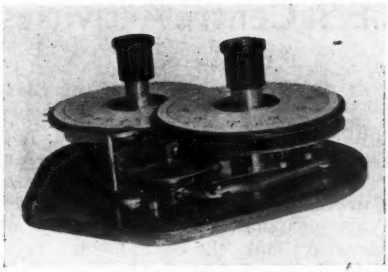


Fig. 1. Showing final design of instrument, with two dials.

The second device, the height finder, is essentially a protractor with a sighting device along the base line and a pendulum which enables the angle of inclination of a given object to be ascertained. The instrument is scaled in feet rise for a given base line. It carries three scales showing heights with projections of 15 ft., 30 ft., and 45 ft. respectively. For accuracy the maximum possible projection should be used. It is of course necessary to add to the reading the height of the meter above ground.

The apparatus has proved very useful in practice, especially when battling with "the engineer's curse"—overhead telephone wires.

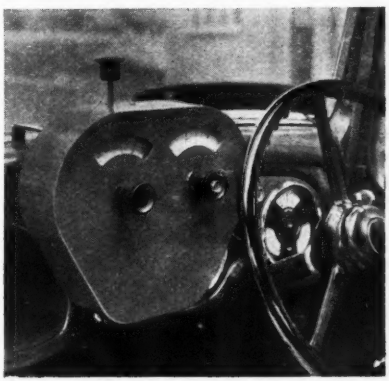


Fig. 2. Showing instrument in position beside steering wheel.

I.E.S. Centre Activities

Glasgow Centre

At the opening meeting of the Glasgow Centre on October 2 a paper entitled "Hot Cathode Circuits and Fittings Design" was presented by Mr. J. Pearse and Mr. E. R. Edinborough.

In the first part of the paper Mr. Pearse explained, with the help of demonstrations, the fundamental principles of fluorescent lamps, and then went on to describe the various circuits used. A number of slides were shown of voltage and current curves for different arrangements of circuits, and existing lamps were demonstrated with and without their fluorescent coatings, an indication of the sizes of future lamps being also discussed.

Mr. Edinborough then traced the design of fittings for fluorescent lamps and showed the various improvements which had been made to simplify erection and maintenance and to improve appearance. The demonstrations which were given included one in which a fluorescent lamp was operated while covered with dry ice.

The discussion after the paper was opened by Mr. C. J. King, who was followed by other members of the Centre and a number of visitors.

The chair at this meeting was taken by Mr. V. P. MacNaughton, who, in taking office, paid tribute to the work which the retiring chairman, Mr. J. M. Henshaw, had carried out on behalf of the Centre.

Manchester Centre

The Manchester Centre opened the session with a lecture on "Glass" by Dr. R. E. Bastick, who began his talk with a short description of the physical properties of glass. The atomic structure of glass was then described and a summary given of the types of glass available and their applications. Types of glass suitable for lighting fittings were shown by means of slides, the glasses being mainly prismatic mouldings or one of the forms of rolled plate. The construction of opal glass was explained and the need stressed for choosing the right base to get the desired refractive index when the fluoride is introduced. The production of heat resisting and absorbing glass and the methods of producing coloured glass and coloured filters were also described.

To conclude his lecture Dr. Bastick showed a film illustrating the production of "Hysil" glass for rectifier bulbs, laboratory glassware, lighting fittings, etc.

Nottingham Centre

In his address to the Nottingham Centre on October 3, Mr. J. C. Charity, the new Centre chairman, spoke of methods of stage lighting control.

Advocating stage lighting by remote control, Mr. Charity said that the operator should be situated so that he could have a view of the whole stage instead of being placed, as at present, where he cannot see the results of his manipulation of the stage lighting control apparatus. He suggested that the operator might work from the orchestra pit or even from a special control room at the back of the circle, where he could look down on to the stage and see the effects he was producing.

He said that remote control panels had been made, though present conditions prevented their use on a wide scale, but he hoped that, when work on theatres and cinemas could again be undertaken, architects and those responsible for the building of new theatres or the modernisation of old ones would give consideration to the suggestions he had made.

Tees-side Group

The Tees-side Group held its first meeting of the session on October 22. The chair was taken by Mr. H. Dickinson, and a talk on "Lighting in the Home" was given by Mr. T. O. Freeth.

In the course of his talk Mr. Freeth stressed the necessity for providing several light sources of modest intensity and suitably located to prevent glare, eliminate dark corners, and to give good lighting intensity where required. He mentioned the possibilities of fluorescent lighting in the home, but considered that the present 5 ft. and 4 ft. tubes were too bulky and too bright to give ideal home lighting, and thought that much better effects would be produced by the shorter tubes when they became available. He also suggested that very pleasing results could be obtained by mixing light from tungsten lamps, daylight and warm-white fluorescent lamps.

Thomas David Jones

We are indebted to Mr. N. D. Houston, now hon. secretary of the I.E.S. Cardiff Centre, for the following supplementary notes of the late Professor T. David Jones, a notice of whose untimely death appeared in our last issue:—

In 1940, Mr. S. G. Turner approached Professor Jones in connection with the formation of an I.E.S. Group at Cardiff. The enthusiasm of Professor Jones and the great assistance he rendered resulted in the formation of a very enthusiastic nucleus of members, and the preparation of an excellent Syllabus of Meetings for the inaugural session. The resources of the Mines Department of the University of South Wales and Monmouthshire, and the Cardiff Technical College were made available to the Society, and many of Professor Jones's colleagues came forward to help with papers on Photometry of Mining Lighting and kindred subjects, with the result that membership rapidly increased and Centre status was soon established.

Professor Jones took his B.Sc. degree at Birmingham University in 1921, gained his colliery manager's certificate in 1922, his M.Sc. in 1923, and the Ph.D. a year after. He later became Senior Mining Investigator under the late Professor J. B. S. Haldane, during which period he carried out extensive scientific investigation of mining conditions, and gained many awards for papers delivered to various bodies. He was made a Commander of the Order of the Crown of Belgium for his valuable services to the mining industry during his visit, in 1946, to Belgian and Dutch coalfields. He was made a Commander of the British Empire (Civil Division) in the last New Year's Honours List. Among his many other honours, he held the gold medals of the South Wales Institute of Engineers and the National Association of Colliery Managers. He held fellowships of the Geological Society, and the Institute of Fuel.

His loss will be keenly felt, particularly by members of the I.E.S. Cardiff Centre, not only because of his wide experience and extensive knowledge, but because "David" was an enthusiast in everything he did and aroused similar feelings among his colleagues.

Export of Lighting Fittings

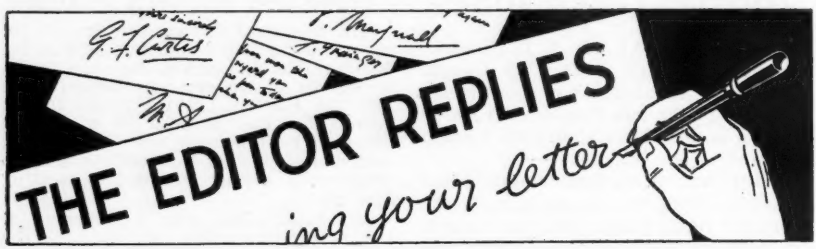
The *Electrical Review* (September 19) reports a meeting which was held at the Waldorf Hotel, London, between representatives of Government Departments and the Electric Light Fittings Export Group for the purpose of discussing steps to be taken by the Government and manufacturers to facilitate and increase the export of electric lighting fittings.

Mr. A. E. Iliffe, who is chairman of the Group, presided. In opening the meeting he said that different problems were met in each of the different sections—decorative and commercial fittings, street-lighting fittings and industrial fittings. The decorative fittings industry was one in which British craftsmanship and art produced goods of great export value. There was also a field for the export of street-lighting fittings of the highest quality, and the industrial fittings group had great export possibilities. In this country we had the advantages of a developed science of illuminating engineering and the results of many years of research.

Following a brief speech by a representative of the Board of Trade a general discussion ensued in the course of which Mr. C. Hughes pointed out that export trade could be based only on a sound home market. Furthermore, it was essential that industries working for export should be properly lighted. Reference was also made to the fact that other countries did not have the same stringent regulations as our own for fittings used in explosive atmospheres whilst, as regards street lighting equipment and industrial reflectors, techniques in this country were higher than in some of the countries overseas, the result being that our fittings appear expensive to foreign buyers.

Mr. R. B. Tippetts (Board of Trade) said that the industry might be asked to double its exports. In replying to the many points mentioned in the discussion he said that the glass industry was being approached with regard to supplies for the production of fittings, but that steel could not be allocated for particular orders as there were serious delays in delivery.

Mr. A. S. Burbidge (President of E.L.F.A.) pointed out that there were many "invisible" lighting fitting exports—in ships, trains, etc.—for which the manufacturers did not get credit. He also stressed the need for good lighting in factories to help win the peace in the same way as it had helped to win the war.



I was interested to get a letter from **Mr. R. Gillespie Williams,** who, it will be recalled, is now in the States. He sends greetings to friends in this country, which I gladly pass on as desired. An American Corporation, of which he is President (Gillespie Williams, Inc.), has now been formed for the purpose of promoting and developing his ideas on **colour lighting.** For these, good opportunities appear to exist in the U.S.A.

Mr. Gillespie Williams tells me that he recently lectured on lighting to the Society of Motion Picture Engineers on the occasion of their 62nd conference in New York. Incidentally, his work on "The Technique of Stage Lighting" has now been published by Sir Isaac Pitman and Sons, Ltd. It will be reviewed in our columns in due course.

I have had some correspondence in regard to the editorial note in our last issue (p. 169) on the new I.E.S. scheme of **Registration of Lighting Engineers,** which is expected to come into operation early in 1948. It was apparently a surprise to some to note that Fellows would not necessarily be acceptable for registration. A glance at the conditions for these respective distinctions will show, however, that the requirements are quite distinct. I imagine that those on the Register will ultimately greatly outnumber the Fellows, and that most of those on the list would not aspire to Fellowship.

On the other hand there will be many Fellows—those who are concerned primarily with pure science and research, for example—who would not desire registration as "lighting engineers" and, indeed, would not be eligible. The Fellowship scheme was initiated before registration had been even considered. It seems possible, therefore, that it might now be found expedient **to modify the conditions of Fellowship** in some degree—certainly not by lowering the standard which, if anything, should now be elevated—by making them broader in scope. This would admit more readily candidates who, whilst distinguished for scientific attainments bearing on illumination, were not practising illuminating engineers in the strict sense. In all this, of course, I am giving only my own personal impressions and beliefs.

My recent reference to the **influence of age on vision,** eyesight and the corresponding increase in illumination demanded has brought me a welcome letter from a correspondent in Vancouver, Mr. E. E. Ackland, who quotes figures given by Dr. Matthew Luckiesh in "Seeing and Human Welfare." According to these data the percentage of people with defective vision increases progressively from 23 per cent. at the

age of 20 to the very large proportion of 95 per cent. at the age of 70.

Another table indicates that the relative area of the pupil decreases proportionately from 100 at 20 years of age to 24 at 80—certainly a remarkable alteration—and it is implied in another column that the relative amount of light necessary varies proportionately, in the approximate ratio of one to four.

Diminution in size of the pupil is doubtless a factor, but it is surely only one amongst several. There are other changes, both in the lens and retina, which reduce acuteness of vision, and the effect of these may be so great that one cannot counteract it by any practicable increase in illumination. However, contraction of the pupil is not wholly bad since it often acts like the stop of a camera lens, increasing sharpness of vision; for this reason also one should not too hastily assume that the requisite increase in illumination is inversely proportional to the pupil area.

An interesting little **"Colour Mixing Guide,"** issued by the Strand Electric and Engineering Co., shows at a glance how dimmers should be manipulated to get a great variety of tints from the mixture of red, green, and blue—orange, blue-green, and blue being also treated similarly as a possible three-colour alternative. There is no doubt that such data are most helpful to the average operator—even though a genius in this field, by the free exercise of his intuitive skill might get even better results. To my mind the same argument applies to the **choice of colours for decoration.** Nothing can quite replace the skill and perception of the artist, but for everyday usage it should at least be possible to draft some simple rules to eliminate serious mistakes.

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Fluorescent Lighting in a Modern Store

An installation of cold cathode lighting, rendered particularly interesting as it coincided with the renewal of a war-damaged ceiling, has recently been carried out by the G.E.C. at the Pantheon store of Marks and Spencer, Ltd., 173, Oxford-street, London, W.1.

This installation is in the front part of the store, which is approximately 50 ft. square and which was previously lighted by 16 tungsten pendants, one in each of 16 panels. The hung ceiling, with void above, had to be put back as before, so the most suitable form of lighting appeared to be a built-in feature in each of the 6-ft. square panels, with the gear in the void.

Each feature comprises 30 ft. of 120 MA. intermediate white tube arranged in two 15-ft. lengths, one each to a transformer, this being the most effcient way of utilising the output of one transformer. Each tube takes the form of a double "U," two identical tubes set face to face forming one complete unit.

Fig. 1. This new cold cathode fluorescent lighting installation at the Pantheon store of Marks and Spencer, Ltd., comprises 16 fittings, one in each of 16 panels. The ceiling has been renewed following war damage.

The two small boxes shown in each of the units contain the turn-round of one tube and the electrodes of the other, the latter being turned up at 90° to their respective tubes and projected upwards inside the false ceiling into suitable electrode boxes.

The stepped motif in the centre conceals the access entry to the gear in the void between the hung ceiling and the concrete slab approximately 24 in. above. The transformers and condensers are in a tray suspended from the slab and all wiring is carried out behind the ceiling.

Light output from a single unit is slightly more than that from a standard G.E.C. cold cathode fitting employing 3 x 8 ft. 6 in. 120 M.A. tubes.

The architects were Lewis and Hickey, F. and A.R.I.B.A., Regent-street, W.1, and the electrical contractors were H. Cripps and Co., Blandford-street, W.1, in conjunction with the Building Department of Marks and Spencer, Ltd.

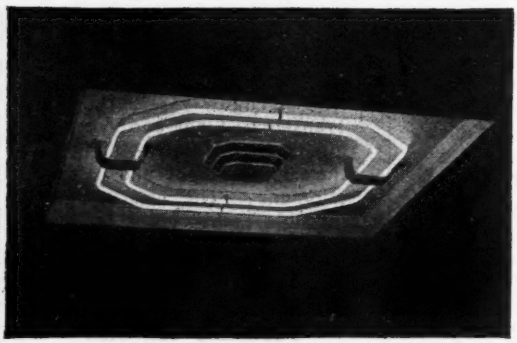

Fig. 2. Each fitting consists of two 15-ft. lengths of intermediate white tube. Each tube takes the form of a double "U," two tubes set face to face forming one complete unit.

Fluorescent Street Lighting in the South-West

(Communicated)

An interesting fluorescent street lighting installation in the South-West of England was that commissioned in Fore-street, Saltash, Cornwall, on October 20 and illustrated above.

The switching-on ceremony, which was performed by the Mayor of Saltash, was attended by representatives from many of the principal cities and towns in the South-West, together with representatives of the British-Thomson Houston Company, Ltd., who designed and provided the necessary equipment.

Six Mazdalux Fluorescent Street-Lighting Lanterns have been mounted on special Concrete Utilities columns at a height of 25 ft. and spaced, three to either side of the road, at intervals of approximately 120 ft. These lanterns, which are of silicon-aluminium alloy construction, have a very neat appearance in daytime and are designed for use with three 80-watt 5 ft. lamps; the necessary auxiliary gear is assembled in the lantern. The lamp and reflectors are protected from dust and the weather by a translucent plastic cover clamped to the body of the lantern. There are hinged covers at each end of the lantern, but it is only necessary to remove one of these for lamp changing and starter switch maintenance.

This successful installation demonstrates the many advantages of fluorescent street lighting. Despite the high efficiency of the lamps—providing a total light output of 5,700 lumens per lantern—there is a marked absence of glare, and undesirable shadows are completely eliminated. The large light source gives a very wide and even illumination over an area comprising the road, kerb, pavement, and the lower parts of adjacent buildings. Colour distortion is obviated by this form of lighting and a very high degree of visibility, out of all proportion to the comparatively small amount of current consumed, is provided.

The lantern is so designed that two of the lamps may be switched off, leaving a single lamp operating for late night "economy" lighting.

Lighthouse Installations Completed

When so much is heard of restrictions and limitations it is pleasant to hear of one field of work that seems to be proceeding vigorously—the equipment of lighthouses, buoys, and beacons in all parts of the world—essentially an export operation.

Within 11 months from the receipt of orders, Chance Brothers, Ltd., have supplied in all 142 lights of various kinds, eight buoys and illuminants for 15 other lighthouses. Included in the list were double-flashing lighthouse installations, kerosene oil lights, automatic acetylene installations, etc.

A feat of special interest was the delivery to the Yugoslav Government of equipment for marine lighting on the Dalmatian Coast, worth about £90,000. It was an obligation to complete delivery, f.o.b., within the operating life of U.N.R.R.A. This condition was met, and the engineer to the Yugoslav Lighthouse Service has expressed complete satisfaction with the equipment.

We also learn that Messrs. Chance Brothers, Ltd., have installed a new automatic plant for the production of machine-made pressed and pressed and blown domestic and lighting glassware, which it is hoped will serve to replace much glassware hitherto imported from abroad.

Home Secretary at Lighting Service Bureau Stand

The above photograph was taken in front of the Lighting Service Bureau stand at the recent R.S.P.A. Silver Jubilee Congress Exhibition in Brighton. The Bureau stand demonstrated the necessity for good light for safety in homes, schools, factories, mines and streets.

The figures from left to right are:—Miss M. D. Wardlaw, Lighting Service Bureau Home Planning Specialist; The Rt. Hon. J. Chuter Ede, M.P., Secretary of State for Home Affairs; The Rt. Hon. Lord Llewellin, P.C., C.B.E., M.C., T.D., D.L., President of the Royal Society for the Prevention of Accidents, and Dame Caroline Haslett, D.B.E.

Proceedings of International Illumination Congress (1931)

The membership of the I.E.S. has grown immensely since 1931, and there must be many who have no recollection of the great I.C.I. gathering held in this country in that year. They may be interested to note, therefore, that the complete Proceedings, comprising two volumes and some 2,000 pages, and including original papers and reviews on almost all aspects of lighting and photometry, are still available. The volumes (price £2 per set) can be obtained on application to the General Secretary, International Commission on Illumination, National Physical Laboratory, Teddington.

I.E.S. 1946 Convention Proceedings

Readers are reminded that copies of the Proceedings at the 1946 I.E.S. Convention are still available. They contain an interesting account of a unique occasion, well worth preservation, besides papers on Physiology of Vision, Lighting During the War and After, New Lamps for Old, Laboratory Techniques for Solving War-time Visibility Problems, Airport Ground Lighting, Daylight and Town Planning and Fluorescent Lighting Practice.

Copies may be obtained from the Secretary of the Illuminating Engineering Society, 32, Victoria-street, London, S.W.1. The price is 10s. per volume (six copies for £2 10s. and 12 copies for £4).